

Hardy Hydroelectric Plant,
Powerhouse
6928 East 36th Street
Newaygo Vicinity
Newaygo County
Michigan

HAER No. MI-100-B

HAER
MICH
62-NEWAY
1B-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
United States Department of the Interior
National Park Service
Great Lakes Systems Office
1709 Jackson Street
Omaha, Nebraska 68102-2571

HISTORIC AMERICAN ENGINEERING RECORD

HARDY HYDROELECTRIC PLANT, Powerhouse

HAER No. MI-100-B

HAER
MICH
62-NEWA.V.
1B -

Location: 6928 East 36th Street
Newaygo Vicinity
Newaygo County
Michigan

UTM: 15:610820:4815530
Quad: Croton

Dates of
Construction: 1930-1931

Engineers: Edward M. Burd, head of civil and hydraulic engineering for
Consumers Power Company, Jackson, Michigan

Present
Owner: Consumers Energy Company (formerly Consumers Power Company),
Jackson, Michigan

Present Use: Powerhouse at hydroelectric generating plant

Significance: The Powerhouse is part of the Hardy Hydroelectric Plant, built in the early 1930s as a link in Consumers Power Company's system of electric power generation. In designing and building Hardy, the company found a way to erect a stable, relatively high dam on Michigan's notoriously gravelly foundations, continuing its tradition of developing solutions to the problems presented by the state's geography and geology. The design process for the dam also appears to reflect a tendency in American civil engineering to favor regional practices over technology developed elsewhere. The architectural treatment of the Powerhouse and other structures at the plant reflect the company's pride in its accomplishment.

Project
Information: This documentation was prepared by Consumers Power Company (CPCo) in conformance with its Cultural Resources Management Plan for the Muskegon River Hydroelectric Projects (July 1995). The plan stipulated the recordation of the entire Hardy Hydroelectric Plant (according to the standards of the Historic American Engineering Record). The documentation was completed in 1997 by Hess, Roise and Company of Minneapolis under the supervision of contract with CPCo. Cynthia de Miranda served as Project Historian under Principal Investigator Jeffrey A. Hess. Project photography was completed under a subcontract with Hess Roise by Clayton B. Fraser of Loveland, Colorado.

PHYSICAL DESCRIPTION

The Powerhouse at the Hardy Hydroelectric Plant (HAER No. MI-100) stands on the downstream toe of the east end of the Embankment (HAER No. MI-100-A). Clad in yellow brick and shingled in green clay tile, the steel-framed, hip-roofed structure is slightly irregular in plan, consisting of a tall rectangular main block (132'-0" x 40'-0") and a shorter rectangular wing (68'-0" x 18'-0") on its northeast corner. The main block shelters generating equipment, while the wing contains a switching room, lunchroom, bathroom, and locker room.¹

In terms of architectural detailing, the downstream (south) facade of the main block makes the fullest statement. Horizontally, this facade is organized in four layers. The lowest is an exposed reinforced-concrete foundation pierced by six openings for discharging spilled water and spent turbine flows. Rising above the foundation, all in yellow brick, are a rusticated plinth with small rectangular window openings; a broad band of tall, round-headed windows accented by orange-brick surrounds and yellow-brick hoods; and a narrow arcaded cornice. Vertically, the facade divides into six equal window bays, each containing an arched opening directly over a rectangular opening. All windows hold industrial steel sash. As evidenced by the ceramic-tile roof, arcaded cornice, and window embellishments, the Powerhouse belongs to the Spanish Colonial Revival style, which was popular throughout the United States in the mid-1920s.²

Although the concrete foundation and brick plinth are exposed only on the downstream (south) facade, the arcaded cornice wraps entirely around the main block. The oversized, rounded-arch window motif also appears on the three other facades, always enriched by brick surrounds and hoods, always at least partially filled with industrial steel sash. A tall, arched opening dominates the center of the east and west facades, serving as a window on the east and a personnel entrance—equipped with a double-leaf personnel door—on the west. The arch is flanked in both cases by single narrow rectangular openings. On the west facade, these openings function as windows, trimmed with soldier-course lintels and concrete sills. On the east facade, the south opening is a window and the north opening a personnel entrance equipped with a single-leaf door.

¹ Although the Powerhouse is aligned along a northwest-southeast axis, descriptions are written to reflect full cardinal points. This description is based on a site survey completed by the authors on 24 July 1995 and on documents produced by Consumers Power Company, including the August, 1931, issue of the *Au Sable News*, which was dedicated to the newly opened Hardy Hydroelectric Plant. See especially E.M. Burd's "Location and Design of Hardy Hydro Plant" in that issue. Also see "Hardy Dam," 1933 summary of plant's features, Historical Files, Civil/Mechanical Engineering Projects, Engineering and Construction, Consumers Power Company, Parnall Road, Jackson, Michigan.

² Marcus Whiffen, *American Architecture Since 1780* (Cambridge, MA: MIT Press, 1981), 226.

The upstream (north) facade of the main block faces the plant's Substation (HAER No. MI-100-C) yard. In terms of siting, it is the rear of the Powerhouse, and displays the least-unified design. The west half holds three tall arched openings; on all three, the upper semi-circular portions function as windows and are glazed with industrial steel sash. The lower portion of the westernmost opening holds an oversize double-leaf vehicle door with a transom containing industrial steel sash. On the two other openings, the lower portions have been infilled with yellow brick. The east half of the main block's upstream (north) facade is largely obscured by the plant's switch-gear wing. Although the wing mirrors the main block in its green-tiled, hip-roofed design, it has no other Spanish Colonial Revival detailing. Its adornment consists of a simple beltcourse and corbelled cornice. The wing's fenestration is limited to two rectangular window openings on its east facade.

The main block of the Powerhouse has two interior levels: the lower "Repair Floor" and the grade-level "Generating Floor." Both levels are largely occupied by three vertical generating units aligned on an east-west axis. As its name implies, the Repair Floor provides access to the base of the generators for maintenance purposes. The tops of the units protrude through the Generating Floor—a north-wall mezzanine enclosed on the south by a metal railing and supported by concrete-encased steel columns rising from the Repair Floor. Also on the Generating Floor, a flat-roofed metal booth with large windows centered on the upstream (north) wall serves the Powerhouse as both office and control room. Metal staircases on either side of the central generating unit link the two floors.³

Powerhouse floors are glazed red-brown tile with cove molding. Brick finishes the interior walls: orange on the lower portions and yellow above. Evenly spaced on the downstream (south) and upstream (north) walls are seven engaged, concrete-encased steel columns with concrete capitals. The columns support a Shaw 80-ton movable crane on steel girders. The building was originally heated by a coke-fired steam boiler in the Powerhouse. The boiler's smokestack, also of yellow and orange brick, is a free-standing unit located just north of the upstream (north) facade of the Powerhouse, near the northwest corner of the Substation (HAER No. MI-100-C) yard. A high concrete retaining wall separates the smokestack from the yard. The boiler was removed at an undetermined date; electric heaters powered through the Substation now provide heat in the winter.

The steel-lined, concrete-encased penstock tubes that connect the Intake Tower (HAER No. MI-100-D) to the Powerhouse split as they enter the latter's concrete foundation. The upper tubes carry water to the spiral scroll cases that direct flows to the turbines, while the lower tubes spill excess water. All water exits the Powerhouse foundation through the draft tubes on the downstream (south) side of the building. The movable A-frame winch that protrudes from the foundation on that side carries a hoisting crane for the draft tube gates.

³ "Powerhouse Layout, Sht. 1, Hardy Dam," Consumers Power Company, Bridge Street file storage, Jackson, Michigan.

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Below the foundation on the downstream (south) side, the concrete-lined tailrace fans to a width of approximately 220' at its downstream end. About 36' from the end of the tailrace apron, a low baffle wall checks the velocity of water discharged through the draft tubes.

HISTORY

The Powerhouse is one of the more prominent structures at the Hardy Hydroelectric Plant (HAER No. MI-100), which was built in the early 1930s as a link in Consumers Power Company's (CPCo) system of electric power generation. Generally, CPCo built utilitarian structures at its developments, and power plant buildings displayed only modest embellishments or subtle allusions to architectural styles.⁴ The well-articulated Spanish Colonial Revival style employed at Hardy was a dramatic departure from that norm.

Planning for Hardy began in the mid-1920s. Edward M. Burd, CPCo's head of civil and hydraulic engineering, first presented a design for the plant in 1926. The Powerhouse in that plan was remarkable in that it was separated from the intake structure, a layout the company had never before employed. Architecturally, however, the Powerhouse followed the precedent set by other plants in the company's system. Burd's design showed a subdued version of the Jacobethan Revival style used at other CPCo plants on the Au Sable River.⁵

Debates over the design of the dam held up the plant's construction for two years. Hardy's proposed 100' head exceeded by 30' any other CPCo development, a notable increase for a system comprising mostly low-head dams. The company, understanding that the relatively large dam it was about to build could bring considerable publicity, apparently began to consider Hardy a showpiece in its system. Hardy's more elaborate architectural treatment reflects that view.⁶

Construction crews began excavation for the Powerhouse and tailrace in January 1930, concurrent with the placement of fill for the Embankment (HAER No. MI-100-A).⁷ Materials and equipment were brought to the site over a nine-mile standard gauge railroad that connected to a nearby rail line. A concrete plant had been established on the east bank of the river, adjacent to the site of the Powerhouse. Concrete for the tailrace slab and the Powerhouse foundation was poured in April and May 1930, and equipment was installed throughout the summer. Touring motorists stopped at the once-secluded spot to watch

⁴ Commonwealth Cultural Resources Group, "Hydroelectric Plant Historical Review" (prepared for Consumers Power Company, Jackson, Michigan, 1991), 12-42.

⁵ Edward M. Burd, "Oxbow Prospectus," 12 December 1926, historical files, Hydro Operations, Consumers Power Company, Cadillac, Michigan; Commonwealth Cultural Resources Group, 16, 23.

⁶ Commonwealth Power Corporation, "Report on Advisability of Construction of Custer Steam Plant or Oxbow Dam during 1927," Report No. R-147, 27 August 1926, in historical files, Hydro Operations, Consumers Power Company, Cadillac, Michigan.

⁷ The construction account is based on photographs taken during erection of the dam and power plant. The collection belongs to Consumers Power Company and is maintained at the site.

construction and to view the massive turbines and steel tubes as they were placed in the building's foundation.⁸

Crews installed the steel superstructure and laid the brick for the Powerhouse walls in autumn 1930. Equipment was still being positioned inside the unfinished Powerhouse structure through winter. Finally, the roof tiles were laid in January 1931, just a few months before the plant went on line.

Changes to the Powerhouse and the equipment it shelters have been limited. In 1946, vacuum breakers were installed for the butterfly valves that control the conduit spillway. Originally, a vacuum formed on the downstream side of the valve when it was opened more than 30 percent, causing vibrations that threatened to throw equipment out of balance. This was not unexpected: the valves, in fact, were not intended to be set at openings greater than 30 percent. Plant operators, however, found occasion to do so about once every two years. As a test, engineers inserted a 3" pipe into the conduit tube at the point where the vacuum formed, allowing air to enter the tube and break the vacuum. As a result of the modification, the butterfly valve could be opened at least to 60 percent without severe vibrations. Similar breakers were subsequently installed on the two other tubes.⁹

In 1960, an explosion in the switching gear destroyed the plant's original control panel, which had been centered in the upstream (north) wall of the Powerhouse, and the switch room wing at the building's northeast end.¹⁰ The rebuilt wing omitted the windows on the north (upstream) side. A new control panel was built and, at an undetermined date, the metal shed enclosing the panel was erected.

The Muskegon River experienced a 250-year flood in 1986, and the draft tubes suffered damage due to the volume of water that necessarily passed through them. Damaged steel in the tubes was removed and replaced with epoxy grout. Inspections after the flood further revealed that the vacuum breakers for the conduit spillway's butterfly valves had endured extensive corrosion since their installation in 1946. The breakers were replaced, and the system remains in use.¹¹

⁸ "Hardy Dam Attracts Many Visitors from the Four Corners of the World," *Au Sable News* (September 1931): 7.

⁹ "Hardy Hydro Plant - Emergency Spillway and Spill Valve Operation," 4 September 1975, historical files, Hydro Operations, Consumers Power Company, Cadillac, Michigan.

¹⁰ E.D. Shantz, Grand Rapids, Michigan, to E.H. Kaiser, Jackson, Michigan, 20 October 1960, historical files, Hydro Operations, Consumers Power Company, Michigan.

¹¹ Charles Smith, Superintendent, Hardy Hydroelectric Plant, Newaygo, Michigan, interview by Cynthia de Miranda, Hess, Roise and Company, Minneapolis, Minnesota, 25 April 1997.

SOURCES OF INFORMATION

ENGINEERING DRAWING

Allied Engineers. "General Layout and Sections: Hardy Dam." Drawing No. M164-G4, Sh. 1, with revisions, 23 September 1984. Hydro Operations, Consumers Power Company, Cadillac, Michigan.

Consumers Power Company. "Powerhouse Layout, Sht. 1, Hardy Dam." Bridge Street file storage, Consumers Power Company, Jackson, Michigan.

INTERVIEW

Smith, Charles, Superintendent, Hardy Hydroelectric Plant, Newaygo, Michigan.
Interview by Cynthia de Miranda, Hess, Roise and Company, Minneapolis, Minnesota, 25 April 1997.

HISTORIC VIEWS

Hardy Hydroelectric Plant construction photographs. Consumers Powers Company, Hardy Hydroelectric Plant, Michigan.

MANUSCRIPT SOURCES

Burd, Edward M. "Oxbow Prospectus," 12 December 1926. Historical files, Hydro Operations, Consumers Power Company, Cadillac, Michigan.

Commonwealth Cultural Resources Group. "Hydroelectric Plant Historical Review."
Prepared for Consumers Power Company, Jackson, Michigan, April 1991.

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